



Blood Product Research - An Update AABB 29 Oct 2002

**Assistant Chief, Dept. of Blood Research
Walter Reed Army Institute of Research**

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Hemoglobin Based Oxygen Carriers - Are we there yet?

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Indications for Using an Hemoglobin Based Oxygen Carrier (HBOC)



- As an oxygen carrier when red blood cells are unavailable or cannot be used (to include when shelf life of red blood cells is expected to be exceeded forward of FST).
- HBOC should not to be used either as:
 - ❖ an alternate to red blood cells because this data does not yet exist for trauma.
 - ❖ a resuscitation fluid (i.e. as an alternate to saline, HSD, etc.) because there is no human data to support this for any HBOC.



STATUS OF "HBOCs"



Company	Product	HGB Source	Clinical Status - U.S.
Baxter	rHb 2.0	Recombinant	Preclinical
Biopure	Hemopure	Bovine	Phase III- BLA at FDA
Curacyte	PHP	Human	Phase III- sepsis
HemoBiotech	HemoTech	Bovine	Preclinical
Hemosol	Hemolink	Human	Phase III- cardio surg.
IPBL Pharma.	OxyVita	Human or bovine	Preclinical
Northfield Laboratories	Polyheme	Human	Phase II- trauma trials

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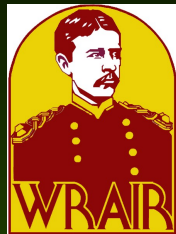


POLYHEME

Northfield Laboratories Inc.



- Glutaraldehyde cross-linked human hemoglobin derived from outdated red blood cell units
- GMP manufacturing 10,000 units annually
- Hemoglobin content = 50g
- Volume: 1 unit PolyHeme = 500 mL; 1 red blood cell unit = 340 mL
- Shelf Life: 1 year Storage = refrigerated



HEMOPURE Biopure Inc.



- Glutaraldehyde cross-linked bovine hemoglobin derived from U.S. beef cattle.
- 100,000 unit capacity
- Hemoglobin content = 30g
- Volume: 1 unit Hemopure = 250 mL; 1 red blood cell unit = 340 mL
- Shelf Life: 2 years Storage = 2-30°C



Hemolink Hemosol, Inc.



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Northfield Laboratories Collaborates With U.S. Army On PolyHeme Treatment IND

Recently Published Trauma Data Leads to Unique Partnership

EVANSTON, Ill., Oct. 4 /PRNewswire-FirstCall/ -- Northfield Laboratories Inc. (Nasdaq: NFLD) announced today that it is collaborating with the United States Army in developing a treatment IND for the battlefield use of its oxygen

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Biopure Receives U.S. Army Grant To Develop Hemopure(R) For Military Trauma Applications

CAMBRIDGE, Mass., Sep 4, 2002 /PRNewswire-FirstCall via COMTEX/ -- Biopure Corporation (Nasdaq: BPUR) today announced that it has received a \$908,900 grant from the U.S. Department of the Army to develop the company's oxygen therapeutic Hemopure(R) [hemoglobin glutamer - 250 (bovine), or HBOC-201] for potential use in military trauma applications.



Biopure's Marketing Application for Hemopure(R) Accepted by the FDA for Review

CAMBRIDGE, Mass., Oct 1, 2002 /PRNewswire-FirstCall via COMTEX/ -- Biopure Corporation (Nasdaq: BPUR) today announced that its Biologic License Application (BLA) for Hemopure(R) [hemoglobin glutamer - 250 (bovine)] has been accepted for review by the U.S. Food and Drug Administration (FDA). The acceptance is based on the agency's determination that the BLA is adequate to permit a substantive and meaningful review.



Bandage Status

**Hemostatic Dressing
Pre-IND Meeting Presentation
September 24, 2002**



Overview



- ◆ **1998 U.S. Special Operations Command (SOCOM) and 1999 U.S. Army developed requirements for a hemostatic dressing**
 - Used for severe, potentially exsanguinating trauma injuries
 - Does not require mixing or combining of components
 - Must be in the form of a dressing that has a support structure strong enough to prevent puncture or tearing during application
 - Develop a strong durable clot at bleeding site within 2 minutes
- ◆ **Contract for Development and Licensure of the HD awarded by the US Army to ARC with CSL as the main subcontractor on September 1, 2001**
- ◆ **ARC embarks on a standard development program - ongoing**



Rationale for Military Field Use



- ◆ Mortality data from Vietnam War indicate that 10% of combat deaths were due to uncontrolled extremity hemorrhage
- ◆ Up to 1/3 of deaths from exsanguination during the Vietnam War could have been prevented with effective hemostatic agents
- ◆ Army has been conducting research to determine most suitable hemostatic agent for field use
- ◆ Army personnel operate in extremely austere environments, often with a delay of up to 96 hours from time of wounding to evacuation for definitive medical treatment.



HD Tested in Comparative Animal Trials



◆ US Army comparative evaluation:

- 9 competitive products tested in 2 animal models
- In venous and severe arterial hemorrhage ARC HD reduced blood loss, increased hemostasis, and increased survival versus control
- ARC HD was the only product that was comparable to the gold standard (sutures)
- All others rated comparable to control (standard gauze dressing)
- In this study, the ARC's HD was the only product that met ALL the Army's and SOCOM's requirements



BANDAGES AT WRAIR



- **human fibrin” dressing - femoral artery**
- **Model “fibrin” dressing using salmon fibrinogen**
- **TachoComb bandage**